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COLLECTION OF PRICES ON BUILDING MATERIALS AND EQUIPMENT GOODS

A Zambian Experience

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Collection of Prices on Building Materials and Equipment Goods - A Zambian Experience

I. Need for Price Statistics

1. The interest in price statistics is widespread. Government agencies, industrial and trading establishments, trade unions, research workers and individual consumers are all interested in price data.

2. Government require up to date price data as a basis for economic analysis. A period of rapidly rising prices will bring undue hardship to the consumers; hence government may wish to enunciate appropriate price control measures. Sudden and sharpfalls in prices of commodities may cause business failures and lead to hardships to builders thus adversely affecting production and employment. Government may like to take preventive action through appropriate price support policies. To decide what action to take and when, reliable price statistics are essential.

3. Industrial and trading establishments plan their purchases and sales depending on the behaviour of market prices. They would like to buy in periods of low prices and sell in times of rising prices. They also wish to know where they can buy goods cheaper. They wish to calculate costs of their material inputs and the profit margins they can make. For these they need basic price data relating to items they buy and sell.

4. Trade union organisations are interested to protect the wages of workers. In periods of rapidly rising prices real wages decline thus making it difficult for the workers to meet their needs. Trade unions wish to enter into negotiations with management for compensating for the price increase. For this they need appropriate price indices.

5. As consumers we are also interested in the prices that we have to pay for various items we buy to meet our daily needs.

6. For all these purposes, it is essential to have up to date and reliable price data.

'Producer Price', 'Wholesale Price' and 'Consumer Price'

7. The price of a commodity varies according to the stage of transaction. The different stages of transaction and the corresponding prices are indicated below.

	Stage of transaction	Price
1.	Manufacturer to Wholesaler	Producer price
2.	Wholesaler to Retailer	Wholesale price
3.	Retailer to Consumer	Consumer price

8. The manufacturer or producer usually sells his produce in bulk to selected agents or wholesalers. The price at which the producer sells is called producer price.

9. The wholesaler sells the commodity in smaller quantities to retail shopkeepers. The price at which he sells is known as the wholesale price.

10. The retailer sells directly to the consumer in individual units or in any possible size or denomination suited to the customer. The price charged by him is known as the retail or consumer price. The consumer (retail) price is usually higher than the wholesale price which is higher than the producer price.

11. It is also possible that sometimes the producer or wholesaler may sell directly to the consumers. The different stages of transaction and the price differentials are important in the study of price levels.

Prices of Individual Commodities

12. It is useful to know the prices of individual commodities at different stages of transaction. There are a large number of commodities which are locally produced and sold or imported and sold. It is indeed difficult to attempt the compilation of the prices of all items sold in urban and rural areas of a country. Collection and dissemination of price data involve considerable effort and resources. Hence price data are collected only for important commodities.

13. Prices quoted by any trading/producing unit for any specific brand/quality of an item are known as 'price quotations'. To understand the price situation in any country numerous price quotations are received. It is difficult to comprehend the movements in a large number of price quotations. The price quotations of any particular item are usually averaged to give an average price for the commodity.

Price Index Numbers

14. Commodity price movements are difficult to comprehend as there are numerous items. To understand the combined effect of price changes, some summary measure is required. The index number is a device which sums up price changes in the various items during any period.

II. Index Numbers of Building Materials and Wholesale Price Index Numbers Compiled by the Central Statistical Office

15. The earliest in the series of quarterly price index numbers of building materials for Zambia was compiled and published by the Central Statistical Office (CSO) with March 1961 = 100 as base. This was revised first in 1968 with base June 30 1966 = 100 and again in 1976 with December 31, 1974 = 100 as the new base period. The series on index numbers of wholesale prices with base 1966 = 100 has been compiled and published by the CSO since 1969. No revisions to date have been made on this series but investigations are going on to find a more recent base period as 1966 base is beginning to show certain deficiencies.

16. The 1968 revision of the 1961 index numbers of building materials series incorporated a number of improvements in respect of coverage of commodities, source of price quotations and method of construction. However, between the two decades of the sixties and seventies, significant changes took place in terms of techniques of construction involving the composition of materials used. As a consequence of these technological developments, some of the materials used in construction had either gone out of use or had become less important while new materials emerged into prominence. These necessitated a revision of the commodity composition and weighting system of the index. In addition opportunity was taken to consider and effect improvements in the following areas:-

a. Coverage of companies from which price quotations were obtained.
b. The basis of allocation of weights for commodities.
c. The need for giving due consideration to the importance of suppliers of materials and
d. The treatment of non-responding units.

17. Similar problems regarding the series of index numbers of wholesale prices exists as outlined above in the case of building materials, as such it may be instructive to look only at problems paused and solutions effected for the compilation of the index number series on building materials.

A. Scope of the Index numbers of building materials and grouping of items

18. The price index of building materials indicates the changes over time of the unit costs of materials used in building construction. The selection of items, selection of suppliers of materials for obtaining price quotations, the grouping of items etc. are dealt with as follows:

Selection of items

19. Considerable attention was devoted to the selection of items for the collection of price data. The list of items included in the 1966 index and the details obtained from an analysis of the statistics of imports of building materials served as the starting point. These were revised on the basis of extensive consultations with major construction companies, the quantity surveying section of the Buildings Branch of the Ministry of Works, the major parastatal organisations and a number of private establishments engaged in building materials trade. Obsolete items were left out while new items were added to the list.

20. The items are classified generally on the basis of the International Standard Industrial Classification. They are grouped by type and according to the nature of price movements. The list of items selected for inclusion in the price index reflects the most commonly used items in Zambia. Special care was taken to include items representative of price movements.

Selection of suppliers of materials

21. The suppliers of materials were selected on the basis of data obtained from various sources, viz:

(a) Registered list of manufacturers: A list of all registered building materials manufacturers is kept by the Industrial Production Division of the CSO. To all these units, a special questionnaire was sent to elicit information relating to the proportion of their products sold to merchants and to construction companies directly. Moreover, information regarding the names and addresses of their major dealers in building materials/customers classified by province together with percentage sales to each of them was obtained.

(b) Register of Building Mineral Permit holders:- The register of building mineral permits gives addresses of companies which have permission to quarry. This provided information for this part of building material supplies.

(c) The lists enclosed with all major Government tenders. The construction companies therein indicate the source from which they intend to obtain their principal building materials.

22. The information contained in the above mentioned sources were used to correct and update the list used for the 1966 index.

Questionnaires for collection of data

23. The questionnaires for the price index of building materials were modified to incorporate all necessary corrections in the items. The existing set of forms were extended to facilitate the distribution of the questionnaires to the suppliers more efficiently. The grouping of commodities, therefore did not completely follow an industrial classification, but at places followed the actual stocking of materials by the suppliers. For instance one usually finds sand, crushed stone and concrete blocks are often supplied by the same company.

24. For small rural suppliers a short list of main commodities was prepared to serve as a base for data collection. The opportunity was also taken to introduce a set of questionnaires which were suitable for direct automatic data processing.

Grouping of items

25. The items are grouped as follows:-

(a) Commodity grouping: This grouping generally followed the "International Standard Industrial Classification of All Economic Activities" (ISIC), United Nations, Series M, No. 4, Rev. 2, Add., on the three digit level.

(b) Provincial grouping: This grouping indicates the price movements of the building materials in each of the 9 administrative provinces of Zambia. However, the Central Province and Lusaka Province had to be grouped together as a large proportion of the requirements of building materials of the Central Province are obtained from Lusaka.

Weighting System

26. The weights were derived on the basis of data gathered from a variety of sources, as no single source of information could provide all the details required for a complete weighting system for the index. The procedures followed for obtaining weights for groups, items, establishments (suppliers) and provinces were:-

(a) Group weights

27. The most important part of the weighting system, the group weights, was derived from the results of the Census of Construction, 1973. The relative importance of each of the twenty seven product groups in the total building materials used was determined on the basis of the data on quantity and value of materials consumed by product group, supplied by the construction companies in response to 1973 Census.

(b) Commodity (item) weights

28. A different procedure was followed for determining the weights of commodities (items) within each group. The suppliers of building materials were requested to provide information on the sales of various items. This information was collected through specially designed questionnaires. In addition, the manufacturers of building materials were also requested to supply details of dealers through whom their products were distributed and the volume and composition of sales to each. The information collected from the above sources together with an analysis of imports of building materials made it possible to determine the relative importance of each of the items for which price quotations were to be collected.

(c) Establishment (unit) weights

29. Respondents to the quarterly price index of building materials were classified by province of location of the establishments. The relative importance of suppliers of a certain item within a province was determined on the basis of data collected through the special questionnaires referred to above. Accordingly a weight was assigned to each of the units within each province.

30. It was assumed that the relative importance of each product within the total was identical for all provinces. This assumption had to be made to facilitate the computation of provincial indices.

(d) Weights for Provinces

31. The relative importance of the construction work done in each of the provinces was obtained from the Census of Construction 1973. Weights were determined on the basis of the value of construction work done in each province. Allowance was made for possible under-estimation of material consumption in the rural areas and for construction activities in the informal sector.

32. The allocation of weights had not been an easy tas . Difficulties were experienced in assigning weights to individual items comprising a group in some cases due to the lack of sufficient basic information. The accuracy of group indices had not been affected by this deficiency as the price movements of

products within a group were identical in a number of cases. In this category may be mentioned items such as steel door and window frames, electrical wiring, reinforcing fabric, reinforcing rods, asbestos cement products etc.

Base Period

33. December 31, 1974 was adopted as the reference base for price comparison. Weights were based on the use pattern of building materials in 1973. As stated earlier, the results of the Census of Construction 1973 have been used to assign weights, supplemented by data specially collected for the purpose.

Steps in Compilation of the Index

34. The overall price index of building materials is obtained after a series of calculations using prices and weights. The steps are outlined below:-

(a) On the basis of the price quotation for each item received from each establishment (reporting unit) price relative is obtained by dividing current price by the price quoted for the previous quarter. (or in case of non-response the last quoted price is used).

(b) The price relative so obtained is then linked to the base period price quoted by the responding unit by chaining it to the index of the previous quarter. This gives a price index for each item for each of the reporting units.

(c) The price indexes for each item for the various reporting units are then combined as a weighted average, weights reflecting the relative importance of each responding unit to the total of all such units. This gives the price index for each item for each province.

(d) The item indices are then combined into group indices as weighted averages, the weights representing the relative share of each item within the specific group. This step gives group indices for different provinces.

(e) The group indices for Zambia are obtained as weighted average of provincial group indices with weights representing the relative importance of each province in the total.

(f) The overall buidling materials price index for Zambia is then obtained as weighted average of the group indices for Zambia, with weights reflecting the relative importance of each group to the total.

35. The group indices for each province (obtained in d) are also combined as a weighted average to arrive at provincial indexes of building material prices. The overall index for Zambia is obtained also as a weighted average of the provincial indexes.

36. Mathematical formulae used for the compilation

Responding unit price indices

Price data for an item from a store (responding unit) at time t = 0, that is, base period is denoted as $P_{(i,s,g,r)_0}$.

Price data for an item from a store (responding unit) at time t, that is, current quarter is denoted as $P_{(i,s,g,r)_t}$.

Price index for each item for each responding unit is given by

$$I_{(i,s,g,r)_t} = \frac{P_{(i,s,g,r)_t}}{P_{(i,s,g,r)_{t-1}}} \cdot X \; I_{(i,s,g,r)_{t-1}}$$

where t-1 refers to the previous quarter.

Notations:

0	base period
t	current quarter
i	item
g	commodity group
s	store
r	province
p	price level
I	index (store-item index)

Weights

$\sum_r W'_{(r)} = 1$	the region weights sum to unity
$\sum_i W''_{(i,g,r)} = 1$	the item weights sum to unity for each group in each region.
$\sum_g W'''_{(g,r)} = 1$	the group weights sum to unity in each region.
$\sum_s W'''_{(i,s,g,r)} = 1$	the store weights sum to unity for each item in each region.

Aggregation

Regional group indices

$$I(g,r) = \frac{\sum_i /W''(i,g,r) \times I(i,g,r)/}{\sum_i W''(i,g,r)}$$

where $\sum_i W''(i,g,r) = 1$ with complete response

National group indices

$$I_N(g) = \frac{\sum_i /W'(r) \times W'''(g,r) \times I(g,r)/}{\sum_r /(W'(r) \times W'''(g,r)/}$$

Regional All items indices

$$I(r) = \frac{\sum_g / W'''(g,r) \times I(g,r)/}{\sum_g W'''(g,r)}$$

where $\sum_g W'''(g,r) = 1$ with complete response

National all items index

$$I_N = \frac{\sum_r / W'(r) \times I(r)/}{\sum_r W'(r)}$$

37. Incomplete response is taken into account at all levels in the formulae given above, as in case of non-response the denominator will be less than unity and the index will be inflated exactly to the extent of non-response.

IV. Conclusion

38. In constructing an index number series on building materials or on equipment goods several problems arise and these in turn dictate the methods and techniques employed in their compilation. Among some important considerations we may site the following:-

Selection of Items

39. Care has to be taken in the selection of items on which price relatives have to be made. One has to first look at the popularity of an item, its permanency and usage on the market, its availability and its sensitivity as a predictor of changes in the market forces. In the Zambian case assistance or expert advise was obtained from all leading authorities in the building industry in deciding finally the items that were included in the index.

Selection of Responding Units

40. The initial step in selection of units of suppliers of building materials or any equipment goods is to obtain a complete frame of sources of supply. In the Zambian example in order to create a complete frame, information on major dealers classified by province was obtained through use of a register of all manufacturers of building materials maintained by the CSO. This was supplemented by use of a register of building mineral permit holders which gave addresses of companies which had permission to quarry as well as the use of lists kept by the Ministry of Works and supply relating to all major Government tenders in which construction companies give sources of principal suppliers of building materials. Further it is worth noting that most suppliers tend to confine their activities to special areas only. Dealers tended to confine their activities to such areas as supply of chemical products only; supply of non-metallic mineral products only; supply of tools and equipment only; supply of timber and other wood products; etc. A choice of establishment for inclusion was made by means of a special questionnaire sent out to find out the proportion of products sold by manufacturers to merchants and directly to construction companies.

Grouping of Items

41. Once a selection of items is made then the next step is to classify them into groups. The basis of grouping used was the "International Standard Industrial Classification of All Economic Activities" (ISIC) of the United Nations at the three digit level. A further sub-classification was made by province according to availability and importance of building materials used.

Weighting System

42. A weighting system in any index numbers series is extremely important in order to bring out the relative importance of any item that is included in the compilation of the series. For Zambia group weights, commodity weights, establishment unit weights and weights for provinces were obtained. Group weights were fixed on the basis of the then latest Census of Industrial Production (1973). Weighting in the case of commodities within each group was determined by a suitable weighing of information from various sources. Suppliers of building materials provided information on sales of various items. In addition manufacturers of building materials provided information on the distribution, volume and composition of sales of items. The above sources together with an analysis of imports of building materials were used in determining the relative importance of items.

43. Establishment unit weights were assigned on the basis of special questionnaire referred to above and through the classification of establishments by province of location. Provincial weights were determined on the basis of relative importance of construction work done in each province as obtained from the 1973 Census of Industrial Production.

Non-Response

44. Non-response problems pause the biggest single challenge to compilers of index numbers. Some causes of non-response include: establishments stopping operations; obselescence of items; new products; irregular supply of items; complex questionnaire forms and general apathy on the part of respondents. In the case of Zambia we have seen that the non-response problem was tackled in two ways, namely:

(a) through use of specialised questionnaires aimed at obtaining information according to the material supplied.

(b) through the adoption of a statistical methodology which took account of loss of information at the commodity, group, establishment and higher levels of aggregation without adverse effect on the index.

Base Period

45. The choice of the base is governed by several factors. When we construct one for the first time the base period is trivially chosen as the earliest period it is possible to compile the index. However a new base period with a revised series is required when (a) levels of industrial activities undergo substantial changes (b) technological changes in the industry take place. Both of these in the Zambian case have been experienced. Note also that the base period can be different for price comparison from that of the weighting system as we have imperically observed for Zambia.